ENVIRONMENTAL ISSUES

The enormously growing human population leads to an increase in demand for various resources. To fulfil these demands, natural resources are being exploited. Thus, leading to various environmental issues like pollution which is making survival of man as well as other organisms difficult on the Earth. The Government of India has passed the Environment Protection Act in 1986 to protect and improve the quality of the environment.

1. Pollution

Any undesirable change in the surroundings of living beings in nature which is harmful to them is called pollution. The agents which bring about such changes are called **pollutants**.

On the basis of the occurrence of pollutants, these can be of following types

Primary pollutants (enter air directly from a source), e.g. SO_2NO_2, Chlorofluorocarbons (CFCs), etc., and **secondary pollutants** (are not directly emitted but are formed when primary pollutants react in atmosphere), e.g. ozone (O_3) and Peroxy Acetyl Nitrate (PAN). On the basis of the degradation, the pollutants can be categorised as

(a) **Biodegradable Pollutants** Sewage, clothes, paper, wood, etc., are the substances which can be degraded by microbial activities. Such materials are called biodegradable pollutants.

(b) **Non-biodegradable Pollutants** Aluminium utensils, DDT, glass, plastic materials, etc., are substances which cannot be decomposed by the activity of microorganisms. Such materials are called non-biodegradable pollutants.

To bring awareness, regarding the environment, 5th June is celebrated as World Environment Day and 22nd April as Earth Day every year globally.

Based on the part of environment that is polluted, pollution is of following types

A. Air Pollution

Undesirable physical, biological, chemical changes occurring in air which adversely affect the environment and the living organisms living in it, is called air pollution. It is caused by

(i) Particulate Pollutants These constitute metallic particles, dust particles, soot, aerosol and smoke.

(ii) Gaseous Pollutants These constitute CO_2, NO_2, H_2S and SO_2-.

Effects of Air Pollution

■It causes respiratory ailments like asthma, cancer, etc. It also increases the transpiration rate in plants. PAN inhibits photosynthesis by inhibiting process of water splitting in Hill reaction that occurs in the presence of light.

■ Carbon monoxide is the main pollutant of air pollution. It reduces the oxygen binding capacity of haemoglobin in the blood which leads to death of organism.

■ Acid Rain Burning of fossil fuels releases oxides of nitrogen and sulphur along with carbon dioxide and carbon monoxide. These oxides along with water forms sulphuric acid (H_2SO_4). Similarly, NO_2 when reacts with water, forms HNO_3 . These two gases present in air as pollutants combine with rainwater and precipitate as acid water. This is called acid rain. SO_2 damages the membrane system of plants, increases the acidity of soil and water bodies which ultimately affects the living beings. It also causes skin diseases.

■ Lichens are sensitive to SO_2 , so they are used as an indicator of pollution.

Note The fossil fuels used in Mathura oil refinery and other industries release high SO_2. It mixes with rainwater and the resultant acid rain damages the marble stone of Taj Mahal.

Control Measures of Air Pollution These are following ways of controlling the air pollution

(i) Electrostatic precipitator is a device to remove particulate matter from exhaust of thermal power plants.

(ii) Scrubber is used to remove harmful gases like SO_2 from industrial exhausts.

(iii) Catalytic converter is fitted into automobiles for reducing emissions of poisonous gases like CO and NO_2 .

Case Study

(a) **Controlling Vehicular Air Pollution : Delhi**

To reduce air pollution, Supreme Court of India announced to convert entire fleet of public transport (buses, autorikshaws, etc., to run on Compressed Natural Gas (CNG) in Delhi in 2002.

(b) **Auto Fuel Policy**The Government of India has enforced to cut down vehicular pollution in cities through application of Euro III in vehicles.

B. **Noise Pollution** The noise of high intensity or loud noise results noise pollution. The level of sound is measured by unit called decibel or dB. Noise level at 80 dB is tolerable in human beings. Sound level higher than 150 dB may cause permanent hearing impairment.

Control Measures of Noise Pollution

(i) Use of sound absorbent material in buildings.

(ii) By muffling noise, i.e. suppressing noise. It can be done by planting more trees.

(iii) Creating horn-free zones around hospitals and schools.

(iv) Sticking to the permissible sound level of crackers and loudspeakers, etc.

Note Air Prevention and Control of Pollution Act, 1981 was amended in 1987 to include noise as an air pollutant.

C. **Water Pollution**

Any undesirable change in the physical, chemical and biological properties of water due to the presence of some factors which ultimately adversely affect the environment and the living organism is called water pollution.

The main sources of water pollution are as follows

■ Household detergents, e.g. phosphate, nitrate, alkane, benzene, sulphonate compounds.

■ Sewage It is the waste effluent from houses. It causes increase in Biological Oxygen Demand (BOD) of water because of presence of organic matter. This causes death of aquatic organisms, e.g. fishes, submerged plants, etc.

■ Pesticides These chemicals are used in agricultural land which get collected in water bodies, e.g. DDT. It enters the food chain and increases in concentration at various trophic levels which is toxic to organisms. This is called biological magnification. The presence of large amount of nutrients in water causes

excessive growth of free-floating algae, i.e. phytoplankton called an algal bloom. Natural ageing of a lake is accelerated by nutrient enrichment of its water which is called as eutrophication.

■ Industrial Waste It causes pollution of rivers, where this waste is disposed off.

Biological Oxygen Demand (BOD)

It is used to measure the pollution level of water. BOD test gives an idea about the biological activity of microbes in the water bodies. Higher level of BOD indicates the high level of water pollution. The drinking water has BOD less than 1 ppm.

Effects of Water Pollution

■ High concentration of mercury (Hg) causes minamata disease and cadmium (Cd) causes itai-itai disease in human beings.

■ Excess of nitrate in water causes blue-baby syndrome or methanoglobenemia in humans.

■ Excess arsenic causes black foot diseases.

■ Disposal of sewage without proper treatment may cause outbreak of serious diseases, such as jaundice, cholera, etc. Control Measures of Water Pollution

■ Decreased use of agricultural chemicals.

■ Proper treatment of sewage before discharging it in water bodies. D. Solid Wastes It is commonly referred to everything that goes out in trash. The various sources are

A. Municipal solid wastes (paper, leather)

B. Industrial wastes (scraps, fly ash)

C. Hospital wastes (disinfectants, needles)

D. Electronic wastes (mobiles, chips)

E. Defunct ships (containers, machinery parts)

Methods of Solid Waste Disposal

■ Open burning of waste to reduce volume.

■ Sanitary landfills where waste is dumped in trenches and covered with dirt.

■ Rag pickers (Kabadiwallas) who separate wastes into reusable and for recyclable categories.

■Recycling of e-wastes in an eco-freindly manner.

■ Incineration (of hospital waste) prevents spread of infections.

E. Agrochemcals and their Effects

After Green Revolution, the use of inorganic fertilisers, etc., has increased to enhance the crop productivity. These chemical substances are toxic to non-target organisms and also pollute the soil and water bodies. It causes problems like eutrophication, biomagnification and soil pollution.

F. Radioactive Pollution

It can be caused by unsafe disposal of radioactive wastes and leakage of radioactive material from power plants. Harmful effects are as follows

(i) Radiation emitted by nuclear waste causes mutations to occur at a very high rate, resulting in various disorders like cancer.

(ii) At high doses, nuclear radiation is lethal.

Radioactive Waste Management

Safe disposal is the pre-treatment of nuclear waste which should be done in suitable shielded containers buried within the rocks, about 500 m deep below the earth's surface.

2. Greenhouse Effect

It is a naturally occurring phenomenon responsible for heating of earth's surface and atmosphere. Greenhouse gases are CO_2, CH_4, H_2O and water vapours.

3. Global Warming

The increase in the average temperature of earth's atmosphere due to greenhouse gases, increased deforestation, etc., is called global warming. Effects of Global Warming

■There has been 0.6°C increase in the average temperature of earth's atmosphere during last three decades. It changes the earth's climate.

■Melting of polar ice caps which has resulted in the rise of sea levels.

■ Thinning of O_3 layer in the atmosphere due to the air pollution.

Control of Global Warming

(i) Reduced use of fossil fuels.

(ii) Improving energy usage efficiency.

(iii) Reducing deforestation.

(iv) International initiatives are also being taken to curb the emission of greenhouse gases, mostly CFCs.

4. Ozone Depletion

Ozone layer is found in the stratosphere of atmosphere. It protects earth specially its life forms from harmful effect of UV-rays of solar radiations. Since 1980, the thickness of the layer is decreasing, so ozone hole is formed in the stratosphere.

The major cause of formation of ozone hole is chlorofluorocarbon gases. Freon is the most harmful chlorofluorocarbon gas. It is used in refrigerator, air conditioner, aerosol spray, etc.

The substances which react with O_3 and cause its depletion are called ozone depleting substances. The depletion of ozone layer allows harmful radiation to reach the earth's surface.

Harmful Effects of UV Rays In the absence of ozone, DNA and proteins of living organisms preferentially absorb UV-B rays and its high energy breaks the chemical bonds within these molecules. This causes

(i) Damage to DNA and leads to mutation.

(ii) Damage to the skin cells and ageing.

(iii) Various types of cancers.

(iv) Inflammation of the cornea, i.e. snow blindness and cataract.

Control of Ozone Depletion

Montreal Protocol An international treaty was signed in 1987 at Montreal, Canada to control the emissions of ozone depleting substances. After Montreal, many other protocols have been made to control the emission of CFCs and other ozone depleting chemicals.

5. Degradation by Improper Resource Utilisation and Maintenance

Degradation of natural resources can occur, not just by the action of pollutants, but also by improper resource utilisation practices.

(i) Soil Erosion and Desertification Top soil is the most fertile layer and it takes centuries to build. Soil erosion is caused by human activities like overcultivation, unrestricted grazing, deforestation and poor irrigation practices. Desertification is also a major problem these days that occurs mainly due to increased urbanisation.

(ii) **Waterlogging and Soil Salinity** Irrigation without proper drainage of water leads to waterlogging in the soil. It draws salt to the surface of the soil apart from affecting the crops. Deposited salts start collecting at the roots of the plants or forms a thin crust on land surface. This affects the plant growth and its productivity.

(iii) **Deforestation**It is the conversion of forested areas to non-forested areas. Almost 40% forests have been lost in the tropics, compared to only 1% in the temperate region. Reasons for deforestation include urbanisation, overgrazing by animals, forest fires, demand of wood and other forest products and Jhum Cultivation (Slash and Burn agriculture is known as Jhum Cultivation in North-Eastern States of India.)

■**Reforestation** It is the process of restoring a forest that once existed but was removed at some point of time in the past. It is the important component of the cycle of growing, harvesting and regenerating forests. Reforestation may occur naturally on a deforested area, but we can speed it up by planting more trees.